Executive Summary

The federal Clean Water Act (CWA) requires that states and tribes restore and maintain the chemical, physical, and biological integrity of the nation's waters. States and tribes, pursuant to Section 303 of the CWA, are to adopt water quality standards (WQS) necessary to protect fish, shellfish, and wildlife while providing for recreation in and on the waters whenever possible. Section 303(d) of the CWA establishes requirements for states and eligible tribes to identify and prioritize water bodies that are water quality limited (i.e., water bodies that do not meet water quality standards). States and tribes must periodically publish a priority list of impaired waters, currently every two years. For waters identified on this list, states and tribes must develop a total maximum daily load (TMDL) for the pollutants, set at a level to achieve WQS. This document addresses the water bodies in the South Fork Clearwater River (SF CWR) Subbasin that have been placed on what has come to be known as the "303(d) list." This document was prepared collaboratively under a Memorandum of Agreement by the Idaho Department of Environmental Quality (DEQ), the Nez Perce Tribe (NPT), and the U.S. Environmental Protection Agency (USEPA).

This subbasin assessment and TMDLs have been developed to comply with Idaho's WQS and TMDL schedule. The first part of this document, the subbasin assessment, is an important first step in leading to the TMDL. This assessment describes the physical, biological, and cultural setting; water quality status; pollutant sources; and recent pollution control actions in the SF CWR Subbasin located in north-central Idaho. The starting point for the assessment was Idaho's 1998 303(d) list of water quality limited water bodies. Eighteen stream segments and one lake in the SF CWR Subbasin were included on this list. The subbasin assessment portion of this document examines the current status of 303(d) listed waters. It defines the extent of impairment and causes of water quality limitation throughout the subbasin. The loading analysis, or TMDL, portion of the document quantifies pollutant sources and allocates responsibility for load reductions needed to return listed waters to a condition of meeting WQS.

Subbasin Assessment at a Glance

The SF CWR Subbasin is entirely within Idaho County, with the county seat at Grangeville, Idaho, and partially on the Nez Perce Reservation (Figure A). Total maximum daily loads were completed in 2000 for the six stream segments in the Cottonwood Creek watershed within the SF CWR Subbasin. This document addresses the remaining 12 listed stream segments and Lucas Lake. Their extent, beneficial uses, and suspected pollutants are shown in Table A. However, at the completion of the assessment of temperature impairment to water quality, it was concluded that many unlisted stream segments throughout the subbasin need heat load reductions to meet WQS. Heat load reductions in terms of stream shading increases were established for stream segments throughout the subbasin.

A new, comprehensive system of water quality accounting is being established by DEQ and USEPA which uses water quality "assessment units" (AUs). The correlation between AUs and the water bodies assessed in this report is presented in Appendix C.

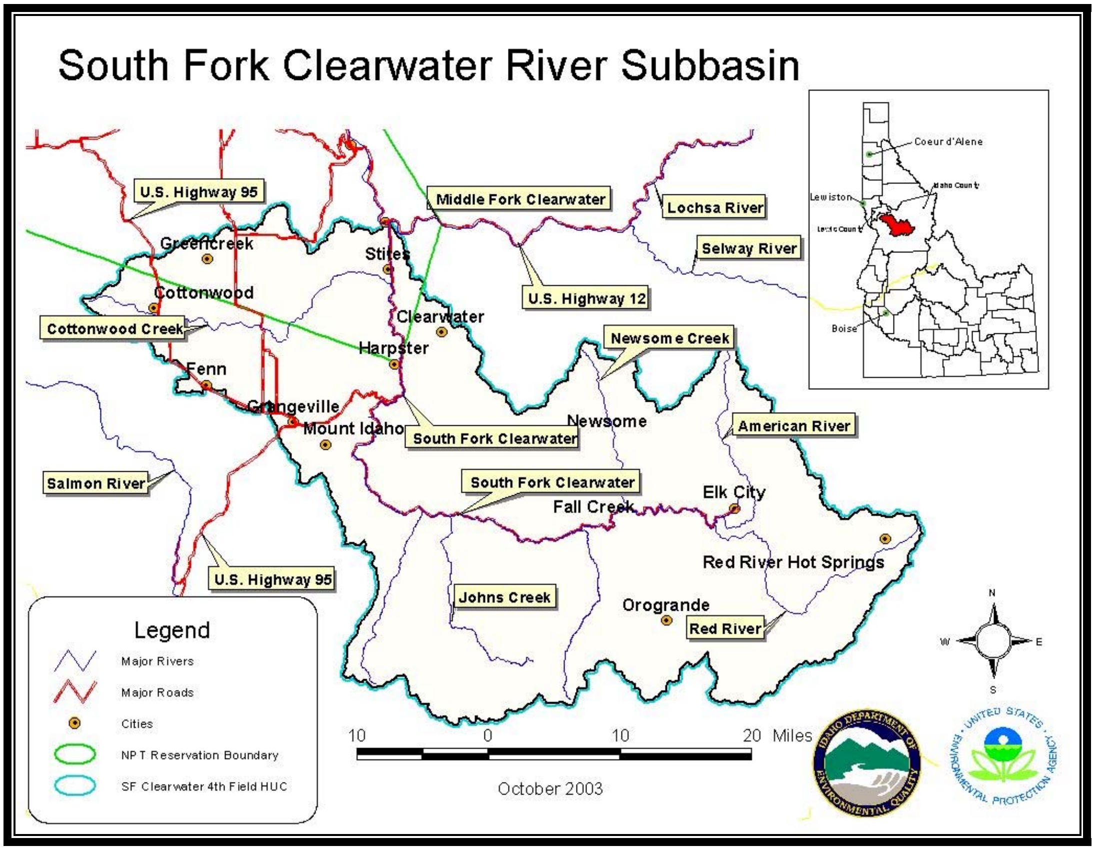

Figure A. The South Fork Clearwater River Subbasin in North-Central Idaho

Table A. Water quality limited water bodies in the SF CWR Subbasin.

Stream Name	Water Body Identification Numbers[a]	Boundaries (1998 303(d) list)[b]	Beneficial Uses[c]	303(d) Listed Pollutant[d]	TMDLs Completed
South Fork Clearwater River	1, 12, 22, 30, 36	Red River to Clearwater River	CW/SS(d) PCR(d) SRW (d)	Halt, Sed, Temp	Sed, Temp
Three mile Creek	10	Headwaters to SF CWR	CW/SS(d) SCR(d)	Bac, DO, Qalt, Halt, NH_3, Nut, Sed, Temp	Bac, DO, Nut, Sed, Temp
Butcher Creek	11	Headwaters to SF CWR	CW/SS(d) SCR(d)	Bac, DO, Qalt, Halt, Sed, Temp	Sed, Temp
Dawson Creek	38	Headwaters to Red River	CW/SS(e) PCR/SCR(e)	Sed	Temp
Little Elk Creek	57	Headwaters to Elk Creek	CW/SS(e) PCR/SCR(e)	Temp	Temp
Big Elk	58	Headwaters	CW/SS(e)	Temp	Temp

Stream Name	Water Body Identification Numbers[a]	Boundaries (1998 303(d) list)[b]	Beneficial Uses[c]	303(d) Listed Pollutant[d]	TMDLs Completed
Creek		to Elk Creek	PCR/SCR(e)		
Buffalo Gulch	59	Headwaters to American River	CW/SS(e) PCR/SCR(e)	Sed	Temp
New-some Creek	62	Beaver Creek to SF CWR	CW/SS(e) PCR/SCR(e)	Sed	Temp
Nugget Creek	64	Headwaters to Newsome Creek	CW/SS(e) PCR/SCR(e)	Sed	Temp
Beaver Creek	65	Headwaters to Newsome Creek	CW/SS(e) PCR/SCR(e)	Sed	Temp
Sing Lee Creek	73	Headwaters to Newsome Creek	CW/SS(e) PCR/SCR(e)	Sed	Temp
Cougar Creek	79	Headwaters to SF CWR	CW/SS(e) PCR/SCR(e)	Sed	Temp
Lucas Lake			CW/SS(e) PCR/SCR(e)	Sed	
58 Other Water Bodies[e]					Temp

[a] A new accounting system for water quality tracking is being setup using water quality "assessment units" (AUs). A given water body may contain one or more AUs. The correlation between water bodies assessed in this document and AUs may be found in Appendix C.
[b] Refers to a list created in 1998 of water bodies in Idaho that did not fully support at least one beneficial use. This list is required under section 303 subsection "d" of the Clean Water Act. This list may change in the future.
[c] CW = Cold Water, SS = Salmonid Spawning, PCR = Primary Contact Recreation, SCR = Secondary Contact Recreation, SWR= Special Resource Water, (d) = designated beneficial use, (e) = existing beneficial use
[d] Bac = bacteria, DO = dissolved oxygen, Qalt = flow alteration, Halt = habitat alteration, NH_3 = ammonia, Nut = nutrients, Sed = sediment, Temp = temperature
[e] Temperature TMDLs were written for the 58 other water bodies in the SF CWR Subbasin, excepting those water bodies covered by the Cottonwood Creek TMDL.

Pollutant analyses were conducted in four distinct groupings: subbasin-wide analyses for temperature (heat loading); subbasin-wide analyses for sediment; Threemile and Butcher Creeks for bacteria, nutrients, dissolved oxygen, and ammonia; and Lucas Lake for sediment.

Subbasin-wide temperature analyses were conducted in light of an extensive database indicating that no stream in the SF CWR Subbasin, not even ones in relatively pristine condition, meets the Idaho numeric temperature criteria for salmonid spawning. However, the Idaho WQS recognize that stream temperatures may naturally exceed numeric criteria and that pollution control measures should only address the human-caused increases in temperature. The non-point temperature assessments assumed that the human-caused effects were increased solar insolation, primarily a result of reduced streamside vegetation and, secondarily a result of increased stream width. Shading and stream width analyses were conducted on all perennial streams in the subbasin. The human-caused stream temperature increase was quantified in terms of the percent decrease in stream shade and increase in stream width. Targets were set based on best estimates of natural conditions for stream shade and stream width. It was recognized that minor amounts of human-caused heat loading occur, such as from hatchery facilities or old mining sites, but allocations were limited to the major source of increased heat loading, reduced stream shading and increased stream width. Point source temperature loadings were calculated based on temperatures and flows, and were generally very low except at the Grangeville wastewater treatment plant (WWTP). Targets for all WWTPs were set to limit temperature increases in receiving waters to less than 0.3^{o}C (0.5^{o}F) above the temperature criteria, as per the WQS and USEPA temperature guidance (USEPA 2003).

Subbasin-wide sediment analyses were based on a limited stream turbidity and total suspended solids (TSS) data set from four locations in the lower subbasin and a sediment delivery budget to streams from various sources. The sediment budget was developed using estimates from different models and data sets from the various sediment sources throughout the subbasin, as follows: NEZSED erosion model estimates of sediment from federally-managed timber land; RUSLE erosion model estimates of sediment from agricultural and range land; a stream bank erosion model estimate of in-stream erosion; WEPP erosion model estimates of sediment from county roads; a Nez Perce National Forest inventory of mass failures extrapolated to include the complete subbasin; and an estimate based on average annual rock crush of gravel from State Highway 14 reaching the river. Point sources of sediment in the subbasin (municipal WWTPs, suction dredges, construction and industrial stormwater runoff) were found to be insignificant in relation to the nonpoint sources.

Turbidity data were compared directly to the state WQS with loadings calculated using turbidity to TSS relationships. Sediment targets and allocations in the lower basin were set to meet the state turbidity criteria. Sediment targets for the upper basin, where no turbidity data were available, were set based on the percent load reduction needed at the mouth of the SF CWR, the Stites bridge control location. It was recognized that minor amounts of human-caused sediment loading occurs, such as from hatchery facilities or old mining sites, but allocations were limited to the major sources identified in the sediment budget. Point source allocations were established at required technology based levels, or at levels in existing National Pollutant Discharge Elimination System (NPDES) permits.

Threemile and Butcher Creeks are 303(d) listed for several other pollutants in addition to sediment and temperature. They were both also evaluated for nutrients, dissolved oxygen, bacteria, and ammonia. Threemile Creek is particularly impacted because it receives effluent from the Grangeville WWTP, which at times makes up more than 50% of the stream flow. Data for pollutants were collected near the mouth of Butcher Creek and at four locations on Threemile Creek. Bacteria, dissolved oxygen, and ammonia data were compared to the state WQS. Nutrient levels were compared to both USEPA guidelines and the state's narrative WQS to determine impairment. In the case of Threemile Creek, where water quality impairment was identified, the target was set for phosphorus based on the USEPA guidelines and local monitoring results. These targets, and the seasonality of their application, may require adjustments in the future as additional data and information are collected. The phosphorus TMDL is expected to result in compliance with the numeric dissolved oxygen standard as well as the narrative nutrient criteria. A bacteria TMDL was also established for Threemile Creek to address the seasonally high levels of *E. coli*.

Lucas Lake, near Elk City, is an old "glory hole" about 2 acres in size from the mining days. It was 303(d) listed because it was identified in the Idaho 1988 *Water Quality Status Report and Nonpoint Source Assessment* (DEQ 1989) as not supporting one or more beneficial uses due to sediment siltation. Turbidity and metals samples were collected for the lake and compared against the state WQS. No impairment was identified.

Key Findings

The SF CWR subbasin assessment and TMDLs have been written with input from a local Watershed Advisory Group consisting of 16 members representing a wide range of interests and land managers. This group met monthly over the course of the project to review progress and provide input. A Fisheries Technical Advisory Group of professionals knowledgeable of the fisheries resources in the subbasin met several times and provided detailed information about the presence and condition of salmonid species in the subbasin.

As a result of the subbasin assessment, temperature TMDLs were written for all 74 water bodies in the part of the subbasin covered by this document; sediment TMDLs were written for the main stem SF CWR, Butcher Creek, and Threemile Creek; and nutrient and bacteria TMDLs were written for Threemile Creek. It is expected that these TMDLs will improve conditions throughout the subbasin for all aquatic species, including threatened and endangered fish species such as bull trout, spring chinook salmon, and steelhead.

Water temperatures are elevated above WQS at all monitoring locations throughout the subbasin. Shading of the water surface has been reduced by logging, roading, mining, grazing, and agricultural activities near the streams and rivers. To a lesser degree, stream channel configurations have been altered by the same human activities. Water channels that have been made wider and shallower, with less vegetative shading, are being heated by solar insolation. The degree to which shade has been reduced and channels altered was assessed on a stream reach by stream reach basis. Current stream shading was assessed using aerial photograph interpretation and other analytical techniques. Potential shade in forested areas was assumed to be 90%. Channel widths in forested areas were assumed to have been little altered in relation to the size of coniferous trees and their ability to provide shade. Potential shade in non-forested areas was calculated from the size and density of an expected natural vegetation and an expected natural channel width. Targets were set to restore stream shading and stream channel morphology to conditions representing minimal human impact.

Whereas stream heat load capacity can be described in terms of joules per day, and some discussion of heat loading in relation to stream shade and channel width is included in this document, loading for temperature is presented in terms of stream shade and stream width.

The load capacity of a given stream reach is set at the heat loading that would occur if the reach were in a relatively undisturbed condition in terms of the channel morphology and streamside vegetation. In the forested part of the subbasin, 3,640 stream reaches were evaluated, of which 54% need various percentage increases of stream canopy closure. An ArcView shapefile is included with the TMDL so users can locate stream reaches and identify whether or not a shade increase is needed, and how much. For the non-forested streams and rivers, more variable current conditions led to the need to have shade and stream width targets defined on a more site-specific basis. Any need for increased shade and/or stream width reduction must be calculated on the ground using a set of graphs which require input of wetted stream width, aspect of the stream, and one of twelve expected natural vegetation categories.

Point source contributions to water temperature increases are minor throughout the subbasin except for the effects of the effluent from the Grangeville WWTP on Threemile Creek. Allocations are established for all WWTPs such that they will not increase stream temperature more than 0.3^{o}C (0.5^{o}F) above established temperature criteria per IDAPA 58.01.02.401.03.a.v, and USEPA regional temperature guidance (USEPA 2003).

Sediment loadings to waters of the SF CWR Subbasin fall into two relatively distinct categories: sediment loadings from agricultural and grazing areas on the order of 10-30 times natural background (per water body) compared to sediment loadings from forested areas no greater than twice natural background. For Threemile and Butcher Creeks which are the primary agricultural areas in the subbasin, TSS based on the turbidity WQS need to be reduced 71% and 46%, respectively, to meet the state WQS. At Stites on the main stem SF CWR, with dilution from the forested part of the watershed, TSS loading needs to be reduced by 25%. At the Harpster control location, which is above the majority of agricultural and grazing areas, turbidity meets the WQS.

Water quality in the upper basin was determined to be degraded by coarse sediment, primarily sand-sized material, as it affects salmonid spawning. The problem is more-or-less basin-wide wherever human activities have occurred. In order to meet water quality objectives, sediment load reduction allocations of 25% were set for the Harpster control location as well as three other upstream control locations (above Johns Creek, above Tenmile Creek, and above Crooked River) on the main stem SF CWR. Control locations were set on the main stem with the goal of directing land managers to reduce sediment from appropriate locations throughout the upper basin. For example, to meet the load allocated to the main South Fork Clearwater River at Harpster reductions may occur anywhere in the watershed above Harpster. The 25% load reduction target was selected as consistent with the load reduction required at the Stites location at the mouth of the main stem.

Point sources of sediment loading include five municipal WWTPs, suction dredge mining operations, and construction and industrial stormwater runoff. All of these sources are very minor in comparison to loading from human-caused nonpoint source runoff. Allocations for these facilities are based on meeting turbidity and treatment requirements in Idaho WQS, and technology based limits for WWTPs.

Bacteria levels in Threemile Creek substantially exceed the *E. coli* criteria in Idaho WQS. Limited data are available to assess the source of bacteria loading, but it is believed that livestock grazing in and around the creek is the most significant source. Other potential sources include stormwater runoff and leaking sewer lines in Grangeville, failed septic systems, and waterfowl and other wildlife. A general load reduction of 82% - 93% has been set for all nonpoint sources. The Grangeville WWTP is a known point source, but due to its disinfection facilities, it contributes less than allowed by the WQS and its NPDES permit. It received an allocation equal to the WQS, with no required load reduction.

Nutrient levels in Threemile Creek substantially exceed USEPA's regional guidance for both nitrogen and phosphorus. The majority of the nutrients are contained in the effluent from the WWTP; however, a considerable portion is also from nonpoint sources. Required load reductions are developed for phosphorus as the limiting nutrient for both the WWTP and non-point sources. Since dissolved oxygen (DO) and nutrient levels are linked, the state WQS of 6 mg/L of DO is set as a target for DO. In order to attain the targets, phosphorus load reductions were set at 32% from the headwaters to the WWTP, 32% from the WWTP outfall to the Nez Perce Reservation boundary, and 0% from the reservation boundary to the mouth. The WWTP received a 97% phosphorus load reduction.

Table B. Streams and pollutants for which TMDLs were developed.

Stream	Pollutant(s)
South Fork Clearwater River	Sediment, Temperature
Threemile Creek	Bacteria, Nutrients, DO, Sediment, Temperature
Butcher Creek	Sediment, Temperature
Dawson Creek	Temperature
Little Elk Creek	Temperature
Big Elk Creek	Temperature
Buffalo Gulch	Temperature
Newsome Creek	Temperature
Beaver Creek	Temperature
Nugget Creek	Temperature
Sing Lee Creek	Temperature
Cougar Creek	Temperature
58 Other Water Bodies	Temperature

Timeframe.

Development of the implementation plan has already begun. The plan is expected to be completed in time to submit for 319 funding in 2004/2005. Wasteload allocations will be incorporated into NPDES permits when they are reissued or reopened. The Grangeville permit is expected to be reissued within the next 1-2 years, and the recently reissued permits for Kooskia, Stites, Elk City and Red River Ranger Station will need to be re-opened to incorporate revised limits.

Implementation of nonpoint source controls has already begun, but is expected to proceed in earnest once the implementation plan is complete and funds are available. A majority of the sources of temperature and sediment loading are nonpoint in origin, and realistically it may take many years if not decades to fully achieve the goals of the TMDL. Certain improvements such as controlling temperature and nutrients from the Grangeville treatment facility or controlling nonpoint bacteria sources are likely to occur within a few years. In order to improve stream temperature, restored riparian communities and stream channels are needed. In smaller streams and watersheds, for example, the exclosure on Big Elk Creek, significant improvement may be seen in several years. It is likely to take decades to see such improvement throughout the watershed given the large scale of needed improvements and the time needed for riparian vegetation to grow to maturity.